

Amendments to the Specification:

Please replace the title as follows:

~~AUTOMATIC REFERENCE POSITION TEACHING METHOD, AUTOMATIC POSITIONING METHOD, AND AUTOMATIC CARRYING METHOD FOR DISK LIKE OBJECT, AUTOMATIC REFERENCE POSITION TEACHING DEVICE, AUTOMATIC POSITIONING DEVICE, AND AUTOMATIC CARRYING DEVICE FOR DISK LIKE OBJECT USING THESE METHODS, AND AUTOMATIC SEMICONDUCTOR MANUFACTURING EQUIPMENT~~
METHOD AND SYSTEM FOR TEACHING REFERENCE POSITION OF SEMICONDUCTOR WAFER IN AUTOMATED WAFER HANDLING MANUFACTURING EQUIPMENT

Please replace the Abstract with the attached amended Abstract.

Please replace the heading on page 1, line 7, with the following rewritten heading:

~~DETAILED DESCRIPTION OF THE INVENTION~~
BACKGROUND

Please replace the heading on page 1, line 18, with the following rewritten heading:

~~Prior Art~~
Related Art

Please replace the paragraph beginning on page 3, line 31, with the following rewritten paragraph:

However, as shown in the flow chart of FIG.26, a conventional teaching work which was previously described is an all manual system by which trial and error are repeated using the guide jig 20 between all instruments with which the carrying robot 4 is participated while visually confirming, and it is a method requiring hard trouble. Since this is a continuation of

tensible-cooperates, while continuously visually confirming the position. Thus, this previous method required significant manual interaction. Since this requires continual manual work by a skilled technician, a time of one full day or more was necessary for only the carrying device shown in FIG.25.

Please replace the paragraph beginning on page 4, line 21, with the following rewritten paragraph:

Further, in the above-mentioned positioning device which is described in JP-B-7-275953, the judging method of a notching portion is geometrically illustrated, but a method of mathematically judging is not found yet. Accordingly, since a method of calculating a disc center by the minimum involution which is an approximation method is adopted, at least 3 of sensors 9 which are detection means are required and at least 7 points in total of at least 6 points on the peripheral rim of a disc and one point of the center of the disc holding portion must be measured. Further, since a point which exists on the peripheral rim of a notched portion and does not exist on a circumference is contained in the 6 points on the peripheral rim without fail, an accurate position is not strictly calculated and precision was bad. Further, there is proposed a calculation equation of determining the radius of a disc from 4 points on the peripheral rim which does not include the notched portion based on known ~~Pythagorean~~ Pythagorean theorem, but since the point on the notched portion cannot be excluded, the accurate radius of a disc could not be really determined.

Please add the following new heading after the paragraph ending on line 2 of page 5:

SUMMARY OF THE INVENTION

Please replace the paragraph beginning on page 7, line 26, with the following rewritten paragraph:

The inventions of ~~Claims 1 and 2~~ an embodiment relate to methods of teaching a reference position using the fore-mentioned principle. Namely, the present invention proposes a method for automatically teaching a reference position which is the reference of the position of a disc-like object in the reference co-ordinate system including the position of a handling device to the handling device of the fore-mentioned disc-like object, comprising a step of determining the center position of a disc-like object having a known radius which was situated at a fixed place being the reference position in the fore-mentioned reference co-ordinate system and a step of memorizing the position of the fore-mentioned fixed place in the fore-mentioned reference co-ordinate system which was determined by calculation based on the fore-mentioned center position in the fore-mentioned handling device as the reference position, wherein a step of determining the center position of the fore-mentioned disc-like object comprises a step of relatively moving a detection means against the fore-mentioned disc-like object and making one lotus of the fore-mentioned detection means cross against the circumference of the fore-mentioned disc-like object, a step of determining the position of two intersections by the fore-mentioned crossing in the fore-mentioned reference co-ordinate system, and a step of calculating the fore-mentioned center position using the specific point on the perpendicular bisector of the section of a line combining the fore-mentioned two intersections, the fore-mentioned two intersections and the radius of the fore-mentioned disc-like object. ~~Claim 7~~ Another embodiment relates to a device for realizing the method.

Please replace the paragraph beginning on page 8, line 30, with the following rewritten paragraph:

Similarly, according to the fore-mentioned principle, when the disc-like object has no concave portion and convex portion, or when these are evaded as described above, a positioning method for a disc-like object according to ~~Claim 3~~an embodiment and a positioning device for a disc-like object according to ~~Claim 9~~an embodiment using one detection means are proposed. The fore-mentioned detection device and positioning device include all devices such as a known robot, a carrying device and a proprietary positioning device by which the methods of the present invention can be realized as functions, as specific embodiments.

Please replace the paragraph beginning on page 9, line 9, with the following rewritten paragraph:

Further, in the methods according to ~~claims 3 to 5~~certain embodiments, it is required to preliminarily teach the center position of the disc-like object, but at that time, the method according to ~~claim 1 or 2~~another embodiment may be used and a conventional known method may be used.

Please replace the paragraph beginning on page 9, line 14, with the following rewritten paragraph:

The inventions according to ~~claims 4 and 10~~an embodiment propose the positioning method and the positioning device when there are the notched portion (concave portion) as the reference place on the peripheral rim of notches, orientation flats or the like as a semiconductor wafer and the convex portion such as a grip installed on a disc.

Please replace the paragraph beginning on page 10, line 22, with the following rewritten paragraph:

Then, as shown in FIG.8 and FIG.9, in ~~Claim 4~~, an embodiment, two different circular arcs may be formed by one sensor and twice rotational operations. Namely, when the center of the disc-like object is calculated, it is rotated while the distance R from the rotational center O to the detection route 43 remains as it is, and it is rotated by deviating the center position of the disc-like object by a distance m at the second time. However, it is required that the distance m is expanded at the second rotational movement to an extent that it is not hanged with the notched portion and set as a narrower interval than the diameter of the disc.

Please replace the paragraph beginning on page 12, line 9, with the following rewritten paragraph:

Further, when the two detection routes 43 and 44 are linear lines in ~~Claims 4 and 10~~, this embodiment, the same can be mentioned, and these are shown in FIG.10 and FIG.11. When the detection route passes the notched portion, it is calculated that the disc center calculated is situated at the outer side from the detection route without fail. The detection routes 43 and 44 are separated by a distance m between parallels so that the notched portion does not enter, the circumference of a disc is cut into two circular arcs, respective ends are measured, and the disc center which is situated at inside viewed from the detection route may be selected.

Please replace the paragraph beginning on page 13, line 3, with the following rewritten paragraph:

Further, ~~Claims 4 and 10 include~~ this embodiment includes also a case that 2 different circular arcs are formed by one sensor and twice straight line motions. Namely, in FIG.10 and FIG.11, when the locus of the detection means 9 draws the detection route 43 at the first

motion and the detection route 44 at the second motion or the loci are drawn in its reverse order, the fore-mentioned illustration is applicable as it is.

Please replace the paragraph beginning on page 13, line 8, with the following rewritten paragraph:

Then, ~~Claims 6 and 12 propose~~ another embodiment proposes a method of correcting a carrying route from a route preliminarily taught so as not to generate collision and interference at carrying a disc-like object such as a wafer to an objective place from the transition quantity of the center position determined, by applying the principle of the present invention to a device having carrying function, and a carrying device for doing so.

Please replace the paragraph beginning on page 13, line 27, with the following rewritten paragraph:

~~Claims 13 to 16 describe~~ Another embodiment describes a method of positioning the disc-like object based on the calculation result by measuring a disc-like object with an unknown radius and calculating its radius and center position and a device thereof, and ~~Claim 17~~ a further embodiment describes a carrying device correcting its carrying route based on the calculation result.

Please replace the paragraph beginning on page 19, line 24, with the following rewritten paragraph:

~~Claims 18, 22, 26, 27, 31 and 35 relate~~ Another embodiment relates to a novel method of using a one-point detecting type sensor and a device thereof among an automatic teaching method, an automatic positioning method, an automatic teaching device and an automatic positioning device which applied the fore-mentioned principle.

Please replace the paragraph beginning on page 19, line 28, with the following rewritten paragraph:

~~Claims 2, 5 and 14 and Claims 8, 11 and 16 relate~~ Another embodiment relates to a novel method in which a sensor locus is a circular route and a device thereof among an automatic teaching method, an automatic positioning method, an automatic teaching device and an automatic positioning device which applied the fore-mentioned principle. The sensor may move on the circular route and the disc-like object may move in rotation.

Please replace the paragraph beginning on page 20, line 1, with the following rewritten paragraph:

Further, the present invention provides an automatic manufacturing equipment of semiconductors and the like in ~~Claim 36~~ an embodiment by using any one of, or a plural number of the fore-mentioned automatic teaching devices, automatic positioning devices and automatic carrying devices.

Please add the following new heading after the paragraph ending on line 12 of page 23:

DETAILED DESCRIPTION OF EMBODIMENTS